CLAIMS

1. Ink jet printhead (130, 221) comprising one or more ejection modules (131, 222), each including a silicon chip (134, 224), a plurality of ejection nozzles (139, 228) arranged adjacent to an edge (133, 223) of the module, ejection cells (137, 226) for said nozzles and delivery channels for the ink (138, 227) of the cells (137, 226), the above-mentioned head being characterized in that said module or said modules (131, 222) each include a distribution channel (149, 231) adjacent to the front (133, 223) and in fluid communication with the delivery channels (138, 227) and a nozzle layer (152, 237), integrated with the relative chip (134, 224) and in which ejection nozzles (139, 228) are made parallel to the front, said head (130, 221) also comprising:

a support (132) for mounting the module or the modules and which defines a feeding duct (143) for the ink in fluid communication with said delivery channels (138, 227); and

sealing means (150, 238) between the module or the modules (131, 222) and said support (132) constituting a fluid seal between the feeding duct (143) of the support (132) and the ejection cells (137, 226) of the module or of the modules (131, 222).

2. Printhead according to claim 1, characterized in that, in said module or in each module (131), the ejection cells (137) are positioned at 0.5-1.0 mm from said front (133).

3. Printhead according to claim 1 or 2, characterized in that said distribution channel (149, 231) is defined by a surface etching in the relative silicon chip (134, 224).

4. Printhead according to any of the previous claims, wherein each chip (134) defines a reference surface (141) upon which are arranged the above-mentioned cells, said head (130) being characterized in that the distribution channel (149) of the module or of the modules is made in an area of a reference surface (141) that includes said front (133) and in which said chip also comprises a series of ribs (151) extending transversally through the distribution channel (149) and partially bearing the nozzle layer (152); said sealing means including a sealing lamina (153) having an edge adjacent to the nozzles (139) and mounted to provide fluid sealing between the nozzle layer (152) and said support (132) and to cover the feeding duct (143).

5. Printhead according to claim 4, characterized in that said ribs (151) are set adjacent to each delivery channel (138).

6. Printhead according to claim 4, characterized in that said ribs (151) are set

adjacent to a plurality of delivery channels (138).

7. Head according to claim 4 or 5 or 6, characterized in that the nozzle layer (152) defines the ejection cells (137) and the delivery channels (138) and is fastened to the above-mentioned ribs (151).

8. Printhead according to one of the claims from 4 to 7, characterized in that the sealing lamina (153) is limited by a tapering edge (154) adjacent to said nozzles (139).

9. Printhead according to one of the claims from 4 to 8, characterized in that the distribution channel (149) is of width 0.3-1.0 mm and said ribs (151) extend for a distance of 0.2-1.0 mm in said distribution channel (149).

10. Printhead according to one of the claims from 4 to 9, characterized in that said ribs (151) are of width 15-30 μm.

11. Printhead according to one of the claims from 1 to 3, wherein the cells and the delivery channels rest upon a given surface (229) of said chip (224), said head being characterized in that, in said module or in each module, the distribution channel (231) is made on a surface (232) of the chip opposite said given surface (229), facing the feeding duct (143) of the mounting support (132) and wherein ducts or slots (233) are provided, passing through said chip which provide fluid connection between the distribution channel (231) on said opposite face (232) and the delivery channels (227) on said given surface (229).

12. Printhead according to claim 11, characterized in that said nozzle layer (222) acts as a fluid seal for said cells (226) and for said channels (231) with respect to said given surface of the chip (224).

13. Printhead according to claim 11 or 12, characterized in that said distribution channel (231) is adjacent to said front, has no bank and defines in the chip a projecting section (236) of lesser thickness and in which said nozzle layer extends over said projecting section.

14. Printhead according to one of the claims from 11 to 13, characterized in that said sealing means include sealing material (239) inserted between the nozzle layer and/or the chip and said support (132).

15. Printhead according to any of the previous claims, characterized in that said nozzle layer (152) defines spaces above the substrate (134) for a height of 10-25 μm in said cells (137) and in said delivery channels (138).

16. Printhead according to any of the previous claims, characterized in that it may be used in a parallel or serial-parallel type printing device and comprises a plurality of modules (131, 222) aligned along said front (133 223) and in which said support (132) comprises a board (159) of rigid material that defines said feeding duct (143) through its thickness; and in which said modules (131, 222) are mounted side by side on said board (159) and with the nozzles (139, 228) aligned parallel to the front (133 223).

17. Printhead according to claim 16, characterized in that it includes a frame (161) mounted on said board (159) beside said ejector modules having the upper surface adjacent to the upper surface of the nozzle layers (152) of the above-mentioned modules.

18. Printhead according to the claims 4 and 17, characterized in that the upper surface of the frame is substantially flush with the upper surface of the nozzle layers (152) and wherein said sealing lamina (153) is mounted tight on the frame (161) and on the nozzle layers (152) of the modules, in correspondence with the above-mentioned ribs (151).

19. Printhead according to the claims 11 and 17, characterized in that said sealing material is arranged between said frame (161) and the nozzle layer (152) or the relative chip of the modules.

20. Process for manufacturing an ink jet printhead (130, 221), comprising the step of preparing ejector modules (111, 222), each including a chip substrate (134, 224) with a relative front (133, 223) having a plurality of resistors (136), ejection cells (137, 226) and delivery channels (138, 227) for the ink of the cells, said process being characterized in that the modules each include a distribution channel (149, 231) in fluid connection with the delivery channels (138, 227) and a nozzle layer (152, 237) having ejection nozzles (139, 228) aligned with said front (133, 223) and arranged above the resistors and in which the head (130, 221) includes a support (132) having an ink feeding duct (143) for one or more modules (111, 222); the assembling of the head including the steps of:

(204, 268) mounting the module or modules (111, 222) on said support (132) so as to have the distribution channel or channels (149, 231) in fluid communication with said feeding duct (143); and

(209, 272) hydraulically sealing the nozzle layer (152, 237) of the module or of the modules from said support, for ink-tightness in feeding the ink between the feeding duct

and the nozzles through said delivery channels.

21. Process according to claim 20, characterized in that the manufacturing process of the modules includes steps of:

(181, 244) making an etching (182, 246) on a given face (141, 229) of the chip (134, 224) to produce said distribution channel (149, 231) between the front (133, 223) and an area adjacent to the resistors and parallel to the front (133, 223);

(188, 251) producing sacrificial volumes (189, 191; 252, 253) for defining the limits of the ejection cells (137, 226) above the said resistors and the delivery channels (138, 227) above the said area;

(196, 262) applying a structural layer (197, 263) over said sacrificial volumes to define said nozzle layer (152, 237); and

(198, 262) producing the ejection nozzles (139, 228) on said structural layer (197, 263) in correspondence with the sacrificial volumes of the cells (137, 226).

22. Process according to claim 21, characterized in that said etching produces on said face (141), in addition to the distribution channel (149), a series of ribs (151) which extend transversally in said channel and in which a part of the sacrificial volumes (192) extends into the space between said ribs (151) and on said channel and a part of the structural layer (156) is applied on the ribs (151) and remains fastened on said ribs after removal of the sacrificial volumes.

23. Process according to claim 22, characterized in that said step of producing sacrificial volumes includes the sub-steps of:

(a) covering said distribution channel (149) with sacrificial photoresist, flush with said data face (141) of the chip (134);

(b) planarizing the photoresist covering the channel and cleaning the parts adjacent to said distribution channel (149);

(c) applying a layer of controlled thickness of sacrificial photoresist on said substrate above the resistors, the ribs (151) and the photoresist covering the channel;

(d) exposing with a mask said layer of controlled thickness for defining said cells (137), the delivery channels (138) and the distribution channel (149) and delimiting said ribs (151); and

(e) developing said layer of controlled thickness constituting the sacrificial volumes (189, 191, 192) for said cells (137), for the delivery channels (138) and for the

distribution channel (149) and leaving zones for attachment of the chip (134) beside said cells (137) and the distribution channels and on said ribs (151).

24. Process according to claim 20 or 21, characterized in that said longitudinal etching (246) is made on the face (232) of the chip (242), opposite the said given face (229), forming a projecting section (236) delimited by the said front (223) and in which a slot forming step (264) is provided, in which slots (233) are produced in the thickness of the projecting sections (236) and in correspondence with the delivery channels (227) and in which, for assembling of the head (221), the modules (222) are mounted on the bearing surface (203) of the support (132) with said slots (233) in fluid connection with the feeding duct (143) of the support.

25. Process for manufacturing a head according to any of the claims from 20 to 24, characterized in that said support (132) includes a board (159) with a bearing surface (203) for said chips (134, 224) and an upper surface (162, 271) adjacent to the feeding duct (143) and a distance from said bearing surface and wherein said upper surface is defined by a frame (161, 230) or is obtained directly from the board, the sealing step including the insertion of sealing means (150, 238) between the chip (134, 224) or the structural layer (197, 263) and said upper surface.

26. Process according to claims 22 or 23 and 25, characterized in that said sealing means include a sealing lamina (153) glued between said upper surface (162, 271) and the structural layer (197, 263), in contrast with said ribs.

27. Process according to the claims 24 and 26, characterized in that said sealing means include sealing material (239) inserted between the fronts (223) of the chips and said upper surface.

28. Ink jet printhead and relative manufacturing process substantially as described and with reference to the drawings.